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*Case Report*

# COVID-19 Associated Reversible Cerebral Vasoconstriction Syndrome Successfully Treated with Nimodipine and Aspirin

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There have been limited cases linking SARS-CoV-2 infection with the development of reversible cerebral vasoconstriction syndrome (RCVS). We hereby report a rare case of RCVS in the setting of mild SARS-CoV-2 respiratory infection successfully treated with nimodipine and aspirin. SARS-CoV-2 attacks the ACE2-receptors, which are expressed in various body organs including the lungs, kidneys, and blood vessels. Vasoconstriction can result from down-regulation of the ACE2-receptors that can lead to sympathetic hypertonia of the cerebral blood vessel walls and/or over-activation of the renin-angiotensin axis.

**Key Words:** Reversible cerebral vasoconstriction syndrome—Posterior reversible encephalopathy syndrome—COVID-19—SARS-CoV-2—Nimodipine—Aspirin



A 31-year-old sexually active, non-smoker female with a past medical history of spina-bifida and idiopathic thoracolumbar scoliosis status post hardware spinal fusion surgery five years ago presented with a one-day history of severe holocranial headaches associated with nausea and visual changes. A thorough neurological examination was intact. She complained of a mild cough as well. She had a positive nasopharyngeal swab for SARS-CoV-2 on RT-PCR assay. A comprehensive drug screen, including amphetamines, cocaine, nicotine, alcohol, and ecstasy, as well as a pregnancy test, were negative. The coagulation profile was within normal limits. She was normotensive during her entire hospital stay. CT sca of the head did not show signs of intracranial hemorrhage or ischemia. MRI-brain showed bilateral patchy gyral-pattern of T2-FLAIR hyperintensities, predominantly within the parieto-occipital lobes, and the frontal lobes (Fig. 1A-D). CT-Angiogram revealed a beading pattern mainly in the basilar artery (Fig. 1E). CT-Venogram showed no venous sinus thrombosis. The cerebrospinal fluid analysis showed normal cell count and protein with negative viral and autoimmune antibody detection. These findings were suggestive of RCVS in the setting of COVID-19 infection and no other predisposing factors. The patient was started on oral nimodipine 60 mg Q4-hours and aspirin 81mg for 21-days. Diagnostic Cerebral Angiogram (DCA) performed 7-days later revealed resolution of the basilar arteriospasm (Fig. 1F). Her symptoms resolved as well.

Reversible cerebral vasoconstriction syndrome (RCVS) typically presents with symptoms of disabling recurrent thunderclap headaches. RCVS is characterized by segmental constriction of cerebral arteries that usually resolve within 3−12 weeks due to a transient disturbance in the control of the cerebrovascular tone. RCVS may result in permanent disability. Complications from RCVS include posterior reversible encephalopathy syndrome (PRES), seizures, ischemic stroke, convexity subarachnoid hemorrhage (cSAH), and intraparenchymal hemorrhage. The identified triggers of RCVS include post-partum state, recreational, adrenergic, or serotonergic drugs. Angiographic diagnosis of RCVS made within 2−3 weeks of the

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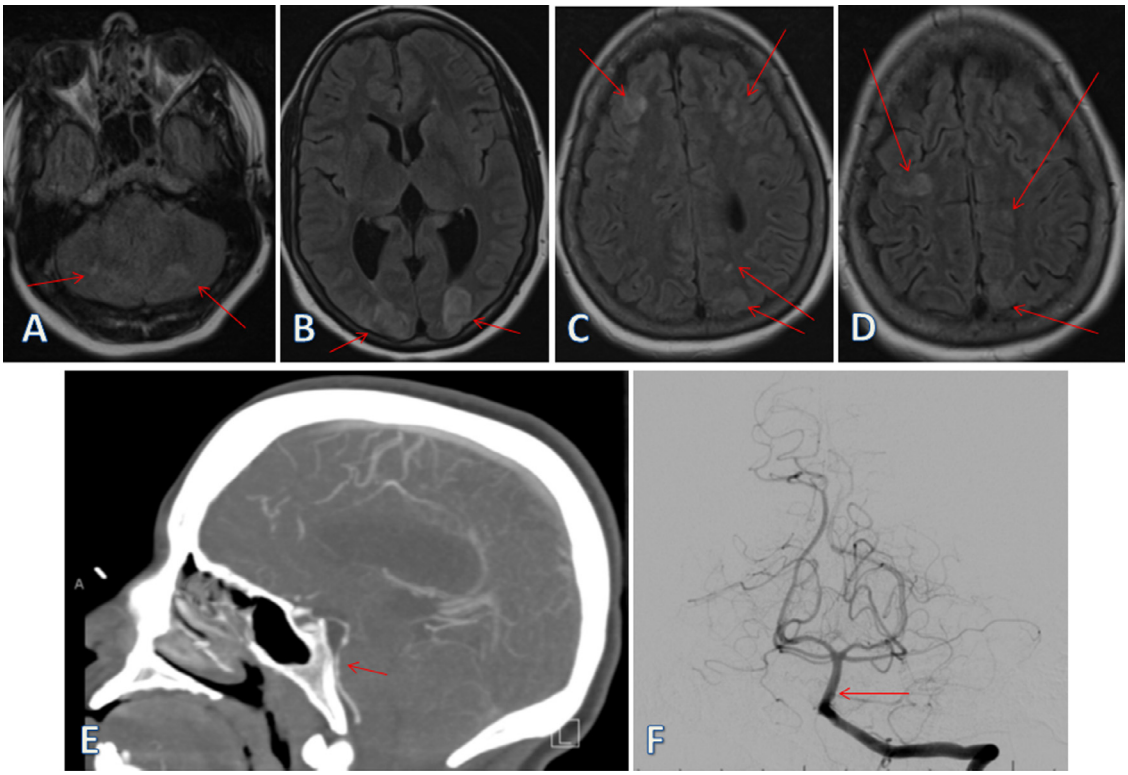


**Fig. 1.** *MRI shows areas of subcortical white matter and cortical T2/FLAIR-prolongation, notably involving the superior frontal lobes, posterior right and left territories (arrows) (A-D) CT-Angiogram shows basilar arteriospasm (beading-pattern) (E). Diagnostic Cerebral Angiogram shows resolution of the arteriospam (F).*

clinical onset is imperative, as cerebral vasoconstriction is at a maximum during this period.[1]

Since the emergence of the novel SARS-CoV-2 virus, it has been linked to various cerebrovascular phenomena. There have been limited cases of related RCVS.[2] However, SARS-CoV-2 may lead to global or segmental cerebral vasoconstriction with the subsequent compromise of the cerebral-autoregulation. It is not directly attributed to the infection itself. It may be attributed to SARS-CoV-2 down-regulation of the ACE2-receptors, which leads to sympathetic hypertonia of the cerebral vessel walls and/or over-activation of the classic renin-angiotensin axis that leads to vasoconstriction, thus, precipitating RCVS.[3] Our case also responded well to nimodipine and aspirin without the development of further complications.

This is merely an observation and should not be considered an association until further studied. Our case report has its limitations. One such limitation is the lack of more reported cases and established data about the association of RCVS and SARS-CoV-2 infection. This is possibly due to the unfamiliarity of the RCVS diagnosis compared to other diagnoses like stroke. Additional case reports will help us establish a definite causal relationship between RCVS and SARS-CoV-2 infection. However, there is adequate data about the pathophysiological processes associated with SARS-CoV-2 infection, which helps illustrate the likely mechanism of RCVS development in patients with concomitant SRAS-COV-2 infection.

Vascular complications in asymptomatic or mildly symptomatic respiratory cases of COVID-19, like the case we presented here, are poorly described in the literature. Although there is a positive correlation between the risk of vascular thrombosis and the severity of the COVID-19 disease,[4] it is not unheard of to have vascular complications in mild cases of COVID-19 infection as well.[5]

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